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GTE

GTE Service Corporation

1850 M Street, N.W., Suite 1200
Washington, D.C. 20036-5801
202 463-5200
Fax: 202 463-5298

February 20, 1998

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie R. Salas
Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, DC 20554

Ex Parte: **Federal-State Joint Board on Universal Service, CC Docket Nos. 96-45 and 97-160 - Proxy Cost Models**

Dear Ms. Salas,

In accordance with Commission Rules, please be advised that today Frank Murphy of Network Engineering Consulting, Inc. (NECI), Timothy Tardiff of National Economics Research Associates (NERA), Gerald Harris and the undersigned, representing GTE, met with Richard Metzger, Don Stockdale, Jim Schlicting, Bob Loube and Richard Smith of the Common Carrier Bureau to discuss the development and use of proxy cost models for universal service. GTE representatives discussed positions submitted in comments in the cost model proceeding as well as specific concerns with the Hatfield Model.

Accordingly, GTE submits an "Analysis of the Hatfield Model 5.0", developed jointly by NERA and NECI, as submitted on behalf of GTE Alabama and Contel of the South to the Alabama Public Services Commission. This analysis reflects the following concerns of GTE regarding the Hatfield Model:

1. The Hatfield model's insensitivity to substantial structural changes (in version 5.0).
2. The model's customer location approach is flawed and closed in nature.
3. The model violates standard economic principles.
4. The model does not comply with the Federal-State Joint Board's list of criteria and has been rejected by several state agencies.

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5. The model violates standard engineering practices and understates associated costs.

If you have any questions regarding this matter, please call me at (202) 463-5293.

Sincerely,

W. Scott Randolph
Director - Regulatory Matters

Attachment

cc: Richard Metzger
Donald Stockdale
Jim Schlicting
Bob Loube
Richard Smith
Charles Kellar

ANALYSIS OF THE HATFIELD MODEL RELEASE 5.0

PRESENTED ON BEHALF OF
GTE ALABAMA INC. AND CONTEL OF THE SOUTH INC.

Gregory M. Duncan
Timothy J. Tardiff
Rafi A. Mohammed
Christian M. Dippon
Aniruddha (Andy) Banerjee
Karyn E. Model
(National Economic Research Associates, Inc.)

Francis J. Murphy
Robert P. Cellupica
Thomas F. Guarino
(Network Engineering Consulting, Inc.)

February 13, 1998

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INTRODUCTION

The Hatfield Model Release 5.0 ("HM 5.0" or "Model") is a cost proxy model developed by HAI Consulting, Inc. of Boulder, Colorado, at the request of AT&T and MCI. The Model purportedly predicts the economic, forward-looking, total element long run incremental cost ("TELRIC") of unbundled network elements ("UNEs"), and can allegedly be used to determine universal service support.

Over the last twenty months, AT&T and MCI have filed eleven different versions and updates of the Hatfield Model with the Federal Communications Commission ("FCC") and various state public utility commissions. We have extensively analyzed and evaluated each version of the Model and have uncovered a wide array of economic, engineering, and algorithmic errors. Moreover, an examination of the substantial changes that were made between releases shows such changes have had relatively little effect on the bottom line.

Each of the eleven versions of the Hatfield Model contains a significant number of largely undocumented and unsupported changes -- different databases, different default values, revamping of key algorithms, etc. The number and significance of these changes should have affected the cost estimates produced by the Model. Surprisingly, however, the cost estimates produced by each Model version do not change commensurate with the magnitude of such changes to the Model.

For instance, in the latest version of the Model, the sponsors purport to have made major revisions to its distribution layout. Instead of its traditional window pane distribution layout, the new Model's documentation now touts that it will locate customers much more precisely.[1] Our

[1]"Hatfield Model, Release 5.0, Model Description", HAI Consulting, Inc., Boulder Colorado, page 5.

analysis suggests that this new approach is fundamentally flawed, misleading, inaccurate and does *not* provide a substantial improvement over the alternative approaches taken in earlier versions of the Model. Moreover, the Model uses the product of this geo-coding exercise in a manner which still results in a purely hypothetical distribution layout.

In addition, Paragraph 250 of the Report and Order of the Federal-State Joint Board on Universal Service demands that all underlying data, formulae, computations, and software associated with a cost model be available to all interested parties. While the sponsors of the Hatfield Model have repeatedly claimed the Model to be publicly available and open for inspection, none of the approximately 12 databases and 5 models that are part of the Model's input database have been made available. They are claimed to be either proprietary, or intellectual property with an estimated price tag of $2.5 million.[2] Moreover, as the Model sponsors freely admit, the file with the actual geo-coded points is claimed to be proprietary and thus unavailable for review.[3]

The purpose of this paper is to present the findings of our review of the Hatfield Model. We will demonstrate that the Hatfield Model does *not* provide reasonable estimates of the costs of local exchange company network elements or universal service fund obligations because the Model: (1) is insensitive to substantial changes; (2) is not based upon company-specific costs and does not even attempt to measure the actual costs that Incumbent Local Exchange Carriers (ILECs) incur; (3) departs from fundamental economic theory in a number of important ways; (4) produces results that are inconsistent with experience and observation; and (5) is based upon significant

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[2] "PNR Estimates of the Resources Required to Support the Customer Location Model," PNR and Associates, Inc., page 2.

[3] Affidavit of Richard N. Clarke, Before the Public Utilities Commission of the State of Minnesota, PUC Docket Nos., P-999/M-87-909, February 4, 1998, page 6.

misunderstandings of regulated and competitive markets. Furthermore, we will demonstrate that the Model does not comply with the requirements for forward-looking cost determinations as set forth by the Federal-State Joint Board.

This paper is divided into five sections. The first section describes the insensitivity of the Model's output to substantial platform changes, its methodological flaws in gathering data and developing assumptions, and its continued reliance upon incorrect input values. Section two addresses HM 5.0's new customer location approach. The third section describes the economic flaws in the latest version, focusing primarily on the inconsistencies in the underlying economic theory in HM 5.0. Section four briefly summarizes the opinions and decisions of several state commissions that have rejected the Hatfield Model for purposes of establishing UNE costs and USF support. The last section of our review discusses the Model's engineering flaws.

Based upon our review, we strongly recommend that the State of Alabama *not* use HM 5.0 as a means of estimating costs or prices for unbundled network elements, interconnection, or establishing universal service obligations. Due to myriad economic and engineering flaws and its failure to comply with the cost model requirements set forth by the Federal-State Joint Board, the Hatfield Model, Release 5.0, like its previous incarnations, does not provide a proper basis for establishing valid and reliable costs and prices for unbundled network elements or local services, either in the State of Alabama or anywhere else. Using the Hatfield Model to determine UNE prices or to estimate universal service obligations would severely distort resource allocation and harm economic efficiency.

One of the principal failings of the Hatfield Model is that it does not even attempt to measure the actual costs of GTE's network in Alabama. Instead, it generates generic "proxy" costs, based upon an entirely hypothetical and futuristic telephone network that does not reflect the likely costs or engineering characteristics of GTE's forward-looking local network. The importance of using *actual*, company-specific data cannot be over-emphasized. An incumbent LEC, such as GTE, that is forced to price its products below its efficient economic costs, cannot possibly survive. Ironically, it would end up cross-subsidizing alternative telecommunication providers, thus facilitating uneconomic entry by its rivals. Any company contemplating entry into the local telecommunications market should compare its costs with the *actual* incremental costs of the incumbent, not against generic *proxy* costs that no firm in the market will ever incur. Prices based on generic proxy costs generated by the HM 5.0, rather than on company-specific costs, will inflict an unfair economic injury on the incumbent LEC and place it at a competitive disadvantage. It will also harm economic efficiency more generally by encouraging inefficient conduct by competing firms. Company-specific costs should be used as the basis for establishing economically efficient rates, and for sizing the universal service fund.

We emphasize that the problems with the Model extend well beyond using the right user-adjustable inputs. While correct input values are important, the problems with the Hatfield Model run much deeper. Even if all inputs were valid, the Model would still produce erroneous universal service support fund and/or TELRIC estimates.

Particular shortcomings of the Model include the following:

- The Model is largely insensitive to structural changes. Even though its modeling techniques and input data have changed significantly over the last twenty months, the bottom line changes very little.

- The Model's input database is flawed and has undergone extensive pre-processing. It is neither user-adjustable nor open for inspection by third parties.

- Many of HM 5.0's default inputs are not supported by the empirical data that the Hatfield Modelers themselves solicited. Indeed, the empirical data supports default inputs that are significantly *higher* than the values used in HM 5.0.

- The Model's proponents fail to provide external or internal justification of the Model's validity, thereby precluding even the slimmest basis for regulators to trust its outputs. Its predictions of presently necessary investments and costs do not comport with real data, and it is incapable of estimating the appropriate costs of producing telecommunications services using the most efficient forward-looking technology.

- The Model does not accurately reflect how any firm operates in the real world -- particularly one operating in the environment fostered by rapid technological change and increased risk and competition that will result from the Telecommunications Act of 1996 -- to efficiently provide services and network elements for new entrants or for use in providing services to its retail customers.

- The Model's cost estimates suggest that in a forward-looking environment, GTE should incur only 55% of its current total operating expenses. While forward-looking costs will not necessarily match dollar-for-dollar, a model that produces forward-looking costs that are roughly one-half of the level of current expenses is simply not credible. Indeed, in the scorched node as opposed to scorched earth environment, many forward-looking costs will be greater than embedded costs.

- There are fundamental inaccuracies in many of the engineering assumptions: certain important costs have been inappropriately excluded; particular input prices are too low; the designed loop does not function; the switch cost assumptions are inaccurate and various components of the E911 and other service assumptions are non-existent.

These and other flaws inherent in the Model are discussed in greater detail throughout this paper.

I. THE MODEL'S INSENSITIVITY TO SUBSTANTIAL STRUCTURAL CHANGES

Each of the eleven versions of the Hatfield Model contains a significant number of largely undocumented and unsupported changes -- different databases, different default values, revamping of key algorithms, etc. The number and significance of these changes should have affected the cost estimates produced by this model but do not. The cost estimates produced by each Model version do not vary commensurate with the magnitude of the changes to the Model.

This bias is illustrated through an analysis of the selective structural changes that have been made to each release of the Model, as well as the Model's reliance upon incorrect data sources, unsupported input values, and presumed efficiency gains.

A. Substantial Changes in the Model Structure Have Produced Little Change In Model Outputs

The Model's insensitivity to changes is due mainly to the fact that potential cost increases are offset with other modifications that *decrease* costs. The following chart, which focuses on Hatfield Model outputs for GTE-California shows that significant increases in the amount of structure has had little effect upon actual outputs:

Table 1
The Evolution of the Hatfield Model
GTE California, Inc.

Version	HM 2.2.2	HM 3.0	HM 3.1	HM 3.1 Update	HM 4.0 Prelim	HM 4.0	HM 5.0
Release Date	9/4/96	2/7/97	2/28/97	4/12/97	7/1/97	8/1/97	12/11/97
Total Loop	\$11.12	\$12.64	\$12.08	\$11.24	\$9.46	\$9.50	\$8.43
Cost of Switched Network Elements	\$15.93	\$16.59	\$17.40	\$16.59	\$14.12	\$14.16	\$12.99
Sheath Miles	17,492	46,821	50,792	37,485	27,407	27,371	24,412

First, consider the change in sheath miles that took place between HM 2.2.2 and HM 3.0. As the above table indicates, sheath miles increased by roughly 170% between the two versions. Consequently, one would expect a similar increase in the Model's cost estimates for the associated loop structure, such as poles. The amount of the increased structure cost can be approximated by calculating the total number of poles that would have to be added to support the new sheath mileage. Using the Hatfield Model's assumption that poles are spaced 250 feet apart in rural areas and cost \$417, the additional sheath miles would result in an increase of \$258,301,676 in structure cost.[4] However, this significant increase in cost associated with additional sheath mileage is not reflected in the Model's bottom line. HM 3.0 generated a loop cost estimate that was merely \$1.50 greater than the estimate generated in HM 2.2.2. The reason for this seeming anomaly stems from the fact

[4] (46,821-17,492)*(5280/250)*(417)=258,301,676. While we recognize that not all of the structure associated with increased sheath miles will be aerial, the other types of structure, buried and underground, are more expensive than aerial plant, and would generally lead to an even greater cost increase.

that there were other largely unsupported changes that offset this cost increase. For example, significant cost reductions were realized through the assumption of further theoretical efficiency gains. The "network operations factor was reduced from 70% to 50%, and structure sharing assumptions were likewise revised downward. In addition, by changing the mix of structure placement (i.e., increasing aerial placement and decreasing underground and buried placement in high density areas) and by lowering the cost per foot for buried and underground structures in most density zones, the increased the number of sheath miles is offset by a reduction in the average cost per foot of support structures.

As a second example, consider the changes between HM 3.1 and its updated counterpart. The original filing of HM 3.1 contained a series of irrefutable algorithmic errors. Sensitivity analyses indicated that the correction of these errors would result in a cost *increase*. However, when the Hatfield supporters filed HM 3.1 updated, in order to address some of the errors, total loop costs and total costs of switched network elements actually *decreased*. Although the modelers had made five corrections which led to increased costs, they simultaneously introduced a new database and a new algorithm for backbone tapering, which offset these cost increases.

A more recent example can be seen in the fourth version of the Model. Due to widespread criticism of the Model's sub-feeder and connecting cable calculation, HM 4.0 contains sub-feeder plant for every Census Block Group (CBG). [Previously the Model included sub-feeder only when the main feeder did not intersect the CBG.] HM 4.0 also accounts for more connecting cable [HM 3.1 erroneously omitted horizontal connecting cables[5]]. Thus, one could reasonably expect that total

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[5] AT&T has conceded this error. *See* October 15, 1997 Hearing Transcript, In the Matter of Public Utilities Commission, Order No. 15478 filed April 2, 1997, instituting a proceeding on communications, including an

cable investment in HM 4.0 would exceed total cable investment in HM 3.1 updated. However, HM 4.0 actually shows a decrease in total cable investment. This is caused by significantly reduced cable prices, and leads to a substantial *decrease* in loop investment.

The justification for this decrease was a change from 24-gauge to 26-gauge cable for cables of 400 or more pairs, and a supposed review of installed cable costs around the country by the Hatfield engineering team. While the material cost of 26-gauge cable might be slightly less expensive than 24-gauge cable (although certainly not to the extent that HM 4.0 and 5.0 assume), engineering and installation costs should remain approximately equal.[6] However, as demonstrated in Appendix A, if the engineering and installation cost (which the Hatfield Modelers maintain are 60% of the installed cost of cable) are held constant from version 3.1 to version 4.0, the material cost for distribution and feeder cables with 1200 pairs or more has been driven to *negative* values.[7]

B. The Hatfield Data Gathering Process Is Methodologically Flawed.

The Hatfield Model fails to develop its underlying structure and input assumptions in a methodologically appropriate fashion. The Model uses inconsistent data sources, searches for low input values, and ignores empirical data. Its input values are often contradicted by the data the developers themselves have solicited.[8]

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investigation of the communications infrastructure of the State of Hawaii, Docket No. 7702 at 1605.

[6] Splicing costs, for instance, are identical for 24 or 26 gauge cable because splicing costs are related to the number of pairs in a cable, *not* the cable gauge.

[7] The negative cost values are illustrated in Appendix A.

[8] It is important to note the difference between "input values" and "input database." Input values consist of the user-adjustable input values in the Hatfield Model. As their name implies, these values can be changed by the user. If no changes are made, then the Model uses the "default values" for these inputs. The input database, on the other hand, consists of an Access database that is not intended to be altered by the user. It contains "vital" information on the characteristics of each carrier, such as the number of lines per cluster, the distance from the wire center to the

1. The Model Uses Inconsistent Data Sources

Many assumptions in the Hatfield Model are based upon the lowest data point the Model developers are able to find. These low inputs values are then mixed together to cost out the hypothetical "telephone system of the future." For example, the Modelers draw upon data from a New Hampshire study for the switch maintenance factor, a Pacific Bell study for the "network operations factor," an AT&T study for trunking requirements, a New York vendor quotation for pole costs, an Iowa contractor for buried placement costs, etc. When the modelers are unable to rely upon any published industry source (a frequent occurrence), the modelers base their assumptions on the "opinion of outside experts."

As a methodological matter, this process of relying upon data from different companies, different geographic areas, and different time periods is patently flawed. By mixing inputs from inconsistent sources and utilizing the lowest cost, the Hatfield Model designs a telephone system that could never be built and a cost structure that will never exist.

This strategy is best illustrated by the Hatfield modelers' continuing attempt to justify its significant reduction in the ILEC's network operations expenses. The Hatfield Model assumes, on a forward-looking basis, that an ILEC will incur only 50% of its present network operations costs.[9] In discovery, AT&T produced a White Paper drafted by one of its employees, Paul Hansen, which discusses this assumption and demonstrates the Model's bias toward low input values.

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centroid of the CBG, etc. All data in this database is pre-processed and cannot be validated.

[9] Hatfield 5.0, Inputs Portfolio, Section 5.4.6.

Initially, the Hatfield developers cited a 1993 New Hampshire study to support their network operations assumptions. When this assumption was shown to be invalid (the New Hampshire study is silent on this point), they abandoned this reference and relied instead upon testimony of a Pacific Bell witness, Richard Scholl, in a California Public Utility Commission/Universal Service proceeding.[10] Mr. Scholl's testimony compared Hatfield cost estimates against Pacific Bell's own estimates and determined that the Hatfield Model *underestimated costs by $1.3 billion.* In virtually every cost category, Hatfield estimates were significantly lower than Pacific Bell estimates. However, because the two studies were structured differently and grouped costs differently, the Pacific Bell comparison noted a Hatfield overestimation relative to its own estimates in its "network operations category."[11] Taking this one estimate out-of-context, the Hatfield modelers began relying upon this reference as its source for the reduced network operations factor.

Hatfield's reliance upon this Pacific Bell testimony soon became, in AT&T's own words, a problem. [12] The "problem" was that Mr. Scholl had filed a declaration in the California proceedings stated that the Hatfield proponents were misrepresenting his testimony.[13] Pacific Bell also explained, through *ex parte* filings with the FCC, that Hatfield's reliance on another Pacific Bell statement for the same proposition was a "gross distortion."[14] Presented with this evidence, the

[10] Testimony of Richard L. Scholl in the California Public Utilities Commission's Universal Service proceeding, R. 95-01-020, L 95-01-021, April 17, 1996, Exhibit 85, p.11 (attached here as Attachment 2)

[11] Testimony of Richard L. Scholl, Attachment 2 at 11.

[12] Network Operations Expense Factor (.50) White Paper, Attachment 1 at 1.

[13] Ibid.

[14] *Ex Parte* filing by SBC Communications with the Federal Communications Commission, CC Docket No. 96-45, May 1, 1997 (attached hereto as Attachment 3).

Hatfield modelers "solution" was not to develop an accurate estimate of a forward-looking network operations factor, but rather to "[f]ind support" for the 50% factor they had already decided upon.[15] This was the express purpose of Mr. Hansen's White Paper. Now, instead of Mr. Scholl's testimony, the Hatfield proponents attempt to justify their 50% reduction through a recitation of hypothetical and speculative opinions as to future efficiency gains.[16]

The modelers' approach in this regard highlights two principal methodological flaws of the Model. First, its focus is oriented to the results its sponsors seek to achieve. The Hansen White Paper was not directed towards ascertaining the appropriate network operation factor the sole purpose was to create new support for a factor that had already been adopted. Second, and equally important, is the fact that the sponsors have no hesitation in relying upon a grab-bag of data sources to support their assumptions without regard to method or consistency.

Other examples of the Hatfield Model's reliance on inconsistent data sources include the following:

- The Model uses incompatible portions of comprehensive price quotations. In the case of telephone poles, for example, it uses the labor estimates from one vendor and the material estimates from another to obtain total labor and material costs that are far below the combined labor/material quotation of any one vendor.[17]
- The Model uses only selected portions of industry studies. It relies upon a New Hampshire study to determine HM 5.0's low switch maintenance factor, but rejects

[15] Network Operations Expense Factor (.50) White Paper, Attachment 1 at 2.

[16] Network Operations Expense Factor (.50) White Paper, Attachment 1 at 2-4.

[17] Testimony of Dean Fassett on behalf of AT&T Communications, Washington Generic Cost Proceedings, Docket Nos. UT-960369, -70, -71, Tr. 429-444.

the same study's assumptions regarding drop lengths that are much higher than those assumed in the Model.[18]

- The Model draws from AT&T's own data sources in certain instances, but on other occasions takes the position that there is no relevance between the costs incurred by a long distance telephone company and the costs incurred by a local telephone company. For example, the Model relies upon an AT&T Capacity Cost Study in the long distance market to determine the traffic and trunking requirements of a local exchange carrier, while rejecting other cost inputs for those contained in AT&T's Transport Incremental Cost Model (TICM) for the long distance market. In particular, the Hatfield Model uses a switch power investment value that is below the TICM value. It uses a switch maintenance factor of 2.69% and a circuit equipment factor of 1.53%, whereas the comparable AT&T values are significantly higher.
- The Model relies upon certain Pole Attachment Agreements to support its assumption that poles are shared by telephone and power companies, but ignores the fact that those same agreements contradict the pole costs, the particular sharing percentage assumptions, and further contradict the Model's assumption that a 40 foot pole is standard in the industry.[19]
- The Model continues to rely upon certain data even after those data have been revised or are no longer reliable. For example, the AT&T Capacity Cost Study was updated in 1995, and the assumption regarding the trunk traffic for local exchanges was revised downward. Nevertheless, Hatfield continues to rely upon the reference in the original study, which clearly is now applicable only to long distance trunks.[20]
- The Model rejects the construction standards detailed in AT&T's own construction handbook. For instance, AT&T's Handbook states that feeder cable and power

[18] Hatfield 5.0 Inputs Portfolio Summary, Section 5.4.7; New England Incremental Cost Study, " 1993 New Hampshire Incremental Cost Study at 27 (attached hereto as Attachment 4).

[19] Fassett 46 (attached hereto as Attachment 5).

[20] Testimony of Robert Mercer on behalf of AT&T, Washington Generic Cost Proceedings, Docket Nos. UT-960369, -70, -71, Tr. 505-507.

facilities should not be jointly trenched; HM 5.0 assumes such joint trenching. When joint trenching with power facilities does occur in distribution, the AT&T Handbook states that minimum separation distances and expensive trenching practices must be utilized; again, HM 5.0 disregards these requirements.[21]

The Hatfield modelers' reliance on input data from different companies, geographic areas, and time periods has the effect of not only underestimating costs, but of making network assumptions that will result in a telephone system that will not work. The following example illustrates this point. Two farms use two different types of harvesting methods. "Large Family Farm" uses ten family members and one machine to harvest its crop and is therefore highly labor intensive. "Hi-tech Farm," on the other hand, uses only one worker and three machines and is therefore highly capital intensive. Both farms harvest the same amount of crop in the same amount of time. In determining the Model's default input values, the developers of the Hatfield Model often selectively choose the lowest component costs observed. In the context of this example, they would choose the lowest input value from each of the two farms to model total harvesting costs. The Hatfield Modelers would use as inputs one machine from "Family Farm" and one worker from "Hi-tech Farm." By making these selective choices, the Hatfield Model essentially suggests that the same harvesting job could be done in the same amount of time with one machine and one worker.[22]

This method will underestimate the cost of harvesting. The problem originates from the fact that input prices depend upon (a) the level of output, and (b) the level of *all* other inputs since one

[21] AT&T Outside Plant Engineering Handbook, August 1994 at 9-6 (attached hereto as Attachment 6).

[22] Note that averaging the values will not remedy the problem at hand. 5-6 workers and 2 machines will still not be able to perform the job in the same amount of time since the group has either too few workers or too few machines.

input might substitute for another input. In the example above, this would mean that both farms need to harvest the same amount of crops. More importantly, the data on capital and labor cannot be separated because the number of workers depends on the number of machines and vice versa. In order to remedy this problem, an appropriate cost model *must* rely on consistent data sources.

Judge McKenzie noted this particular defect in the Hatfield Model in his recent draft decision.[23] The opinion criticized the Hatfield Model for relying upon the use of data from New Hampshire to estimate switch maintenance expenses in California. To the extent data from another jurisdiction is used in estimating costs, it should be from a state with demographic and topographic documentation reasonably comparable to California's. [24]

2. The Model Developers Selectively Use Their Own Empirical Data

The default inputs contained in early versions of the Hatfield Model were heavily criticized because the inputs were largely unsupported. Prior to the release of Version 3.0, the modelers formed an "engineering team" to conduct an industry survey to validate the engineering assumptions and corresponding default input values contained in later releases of the Hatfield Model, including HM 5.0. One member of the Hatfield engineering team, Dean Fassett, was intimately involved in the process of acquiring and reviewing industry survey data. (We refer to the materials Mr. Fassett retained in determining the input values of the Hatfield Model as the "Fassett" materials.)

The purpose of the survey conducted by the engineering team, and specifically by Mr. Fassett, was to obtain, as Mr. Fassett notes in an e-mail message to the head of the Hatfield

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[23] Draft Decision ALJ McKenzie, Before the Public Utilities Commission of the State of California, Docket Nos. R.93-04-003 and I.93-04-002, Mailed December 23, 1997, Page 35.

[24] Id. at 32.

engineering team, "an *average* cost of constructing local loop facilities to provide dial tone."[25] These "average" costs would presumably be used as the default inputs in later releases of the Hatfield Model. Previous versions of the Hatfield Model Inputs Portfolio indicated these average costs were indeed used as the default values. The HM 5.0 Inputs Portfolio filed in this proceeding now states that the values used fall somewhere in the range of the quotes received by the engineering team.[26]

However, a review of the HM 5.0's input values reveals that the key components are not based upon empirical survey data or averages. Rather, they appear to be based upon a number of arbitrary and questionable value judgments by the Hatfield engineering team that actually conflict with the team's own empirical data.

One memorandum contained in the documentation produced is particularly telling. On January 19, 1997, the Hatfield engineering team leader, John C. Donovan, wrote a memorandum to his team members in response to questions of the FCC Joint Board Members regarding placement costs in difficult terrain that he considered "uninformed." Mr. Donovan told the engineering team to simply "make up some default numbers, because we could always change them before publishing the model."[27]

It appears that this approach of "making up" (but then never correcting) default values is the one used by the engineering team. A comparison of the ten contractor quotations[28] received by the

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[25] Fassett 213 (attached hereto as Attachment 7).

[26] Hatfield Inputs Portfolio, *See, e.g.*, Sections 2.2.2. (Drops); 2.4.1. (Poles); 3.6 (Manholes).

[27] Fassett 188 (attached hereto as Attachment 8).

[28] See Directl Testimony of John C. Donovan on Behalf of AT&T Communications of the South Central States, Filed February 3, 1998. A review of the validation chart that appears in Mr. Donovan's pre-filed testimony indicates that the engineering team received 15 quotes. See Exhibit JCD-2. However, contractors, i, k, and l were not

team for plowing in "desirable" soil (described by Mr. Fassett as"Sandy, Loam, etc.") and "more difficult" (described as rocky soil condition) supports our conclusion. The average contractor quotation for plowing cable in "more difficult" soil was 60% higher than that quoted for plowing cable in desirable soil. In fact, some quotations were up to 120% higher. These quotations, however, were never used to develop the terrain factors in the Model.

While there is no category labeled "rocky soil" in the surface texture effect table, the Model's difficult terrain multiplier for bouldery, very bouldery, and stony soil reflects only a 10% increase in cost.[29] HM 5.0's cost treatment for very stony soil is a 20% increase in cost while extremely bouldery and extremely stony surfaces merit only a 30% increase in cost. This is far less than the 60% increase that the engineering team's own data indicates is necessary.

The practices described above resulted in the Hatfield Model using artificially low, unsupported values for many of the Model's default inputs. To illustrate this point, consider the Model's default values for pole material and pole installation. The HM 5.0 Inputs Portfolio, at Section 2.4.1, indicates that the material cost of a pole is $201, and the labor cost to install the pole is $216 - for a total of $417 per pole, including anchors, down wires, and guys. Our review of the Hatfield engineering team's own documentation indicates that the team never received a contractor quote of $417 for the total cost of an installed pole. Instead, it is clear the Hatfield Model developers

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asked to distinguish between desirable and difficult soil, therefore, there is no reason to assume that they would charge the same price. Contractors p and q were also excluded because these quotes were not received until after the values in Version 3.1 were established.

[29] Hatfield 5.0 Inputs Portfolio Summary, Section 6.5.

selected a labor portion from one quote, and a material portion from another quote, to arrive at the $417 value.[30]

In choosing the labor portion ($216), the developers failed to adjust this labor estimate to include two other price components -- overhead and profit -- which the contractor specifically noted were excluded from his quotation.[31] In picking the "materials" quotation of $201 from a stock list provided by a small telco, the developers ignore the fact that this quotation does not indicate whether it includes the costs of guys and anchors, and it is unlikely that they are included. Other information received by the engineering team estimated the cost of down-guys and anchors to be $292 per pole.[32]

The practice of using the labor quotation from one source and a material quotation from another source violates standard bidding practices. Bids for installing a pole are based on the practice that the total project -- materials and labor -- will be provided by the same firm. HM 5.0 disregards this industry reality. If the Hatfield engineering team wanted to use the same firm that provided the lowest labor cost for installing a pole, the corresponding material price from that same contractor should have been used as well. Had the Hatfield modelers done so, it should have used as the Model's default input the actual installed price of a pole as quoted by this contractor -- $577.

The practice of rejecting actual quotes received by the engineering team is commonplace in the Hatfield Model. Instead of using the average quote (which was the admitted purpose of conducting the survey), the modelers instead systematically choose as the Model's default value one

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[30] Fassett 295;(attached hereto as Attachment 9).

[31] Fassett 292, Attachment 9.

[32] Fassett 295, Attachment 9.

of the lowest, and often the *absolute* lowest price quote received. Examples include inputs for buried drop placement (average quote received -- \$.70; lowest quote received -- \$.60; value in HM 5.0 -- \$.60); and drop distances (average distance received in suburban areas -- 86 feet; lowest received -- 75 feet; actual value used -- 50 feet). Our review of aerial drop values and manhole values show similar results.

The decision of the Hatfield modelers to use the lowest price quote received as the Model's default input value all but guarantees that the inputs are invalid. The practice of consistently choosing the lowest bid from a number of quotes is methodologically unsound. First, it is well known that some vendors will overestimate their costs and others will underestimate their costs, which leads to the prevalent problem of underbidding a project and consequent cost overruns. A well-known example of the problem of using the lowest price quote as a default value occurs in typical "bidding" activities for projects. Normally, because the lowest bid received for a project is the bid ultimately chosen, there is, as a consequence, a higher probability of obtaining a bid that is actually below cost. Using the winning bids as estimates of the true lowest price in the market produces a negative bias. To illustrate this point, suppose that each firm gives an unbiased bid on a job. Unbiased means that the bid is no more likely to be wrong on the low side than on the high side. Each bid will include the estimate of cost plus overhead and profit. If the lowest bid is always chosen, then a sample made up only of lowest bids will have a disproportionate number of "unlucky" contractors who bid too low. The lowest of these represents the worst estimate on the low side. One might try to argue that the ILEC could count on these low estimates, and benefit from them, but this is wrong. For small firms, such estimates lead to bankruptcy and unfinished jobs. Moreover, such small firms would be completely unable to provide the services and materials necessary to build the reconfigured network. Larger firms typically renegotiate -- leading to the cost overruns. Estimates of prices must be taken from the costs of jobs *actually completed.* This would be based on the records of the firms who employed the contractors and/or vendors -- in other words, ILEC's actual cost experiences.

Second, the lowest price may simply not be available except in a particular region. For example, labor rates may be very low in northern New York State, where the bulk of the Fassett quotations were obtained, but that is irrelevant to Alabama. Thus, contract bids are highly state - or even county - specific, and cannot simply be applied to the entire nation.

Third, the lowest price for materials may only be available if the ILEC buys labor <u>and</u> installation from the same vendor or some kind of package. Mixing and matching labor bids from one vendor and material bids from another vendor to estimate the total cost of a complete project results in artificially low and biased estimates.

Fourth, if a vendor with no track record, or worse, with a poor one, offers the lowest price, it will not be the winning bid, even if it is significantly lower than all other bids. In their decision to purchase network equipment, ILECs also consider issues such as quality assurance, customer service, and past working experience. It will cost much more if the ILEC decides to purchase an item that might have been the lowest cost bid at acquisition, but the acquired equipment caused a network failure.

Finally, the Hatfield modelers' assumption that the lowest price quote received will remain constant for the duration of the Alabama network rebuild is contrary to basic economic theory. The price quotations relied upon by the Hatfield modelers reflect the current supply and demand of a given product. But if Hatfield's "low bidder" is called upon by all of the ILECs to rebuild their